

**WHAT IS CLAIMED IS:**

1           1.       A method for transmitting a stream of digital data values, comprising:  
2           modulating a carrier wave to carry symbols representative of successive digital  
3           data values, symbols representative of successive ones of the digital data values  
4           interfering more in the modulated carrier wave than in a reference wave transmitting the  
5           same symbol rate as the modulated carrier wave, the modulated carrier wave having a  
6           narrower spectral width than the reference wave, the reference wave being produced by  
7           modulating the same carrier wave with one of the digital data values at a time and having  
8           an effective symbol rate more than twice as great as the modulated carrier wave.

1           2.       The method of claim 1, wherein the modulating a carrier wave includes  
2           amplitude modulating the carrier wave with a non-return-to-zero waveform whose  
3           amplitude is sequentially defined from successive values of the symbols.

1           3.       The method of claim 1, wherein the modulating a carrier wave includes  
2           amplitude modulating an optical carrier.

1           4.       The method of claim 3, wherein the modulating includes amplitude  
2           modulating the carrier wave with a non-return-to-zero waveform whose amplitude is  
3           sequentially defined from successive values of the symbols.

1           5.       The method of claim 1, wherein the digital data values are data bits.

1           6.       A method of transmitting a stream of digital data values, comprising:  
2           generating a stream of symbols by processing the digital data values with a partial  
3           response function defined by  $[1 + \sum_{i=1}^K Z^{-i}]$ , the integer K being greater than one, and the  
4           functions  $Z^{-1}$  delaying the digital data values by i times the period between successive  
5           ones of the digital data values; and  
6           modulating a carrier wave with the generated stream of symbols.

1           7.       The method of claim 6, wherein the modulating includes amplitude

2 modulating the carrier wave with a non-return-to-zero waveform whose amplitude is  
3 sequentially defined by a sequence of the symbols.

1 8. The method of claim 6, wherein the modulating includes amplitude  
2 modulating an optical carrier.

1 9. The method of claim 8, wherein the modulating includes amplitude  
2 modulating the carrier wave with a non-return-to-zero waveform whose amplitude is  
3 sequentially defined by a sequence of the symbols.

1 10. The method of claim 6, wherein the integer K is odd.

1 11. The method of claim 6, wherein the digital data values are data bits.

1 12. A transmitter of digital data, comprising:  
2 a modulator having an input for a carrier signal and an input for a first stream of  
3 symbols representative of digital data values, the modulator to modulate the carrier signal  
4 with sequential values of symbols of a second stream, each symbol of the second stream  
5 being a sum of the present symbol and the last K symbols of the first stream, the integer  
6 K being greater than one.

1 13. The transmitter of claim 12, wherein the modulator processes the symbols  
2 of the first stream with a partial response function defined by  $[1 + \sum_{i=1}^K Z^{-i}]$ , and the  
3 functions  $Z^{-i}$  delaying symbols by i times the period between successive ones of the input  
4 symbols.

1 14. The transmitter of claim 12, wherein the modulator modulates the carrier  
2 signal with a non-return-to-zero waveform whose amplitude is sequentially defined by  
3 the sequence of symbols in the second stream.

1           15.     The transmitter of claim 12, wherein the modulator is configured to  
2     modulate an optical carrier.

1           16.     The transmitter of claim 15, wherein the modulator modulates the optical  
2     beam with a non-return-to-zero waveform whose amplitude is sequentially defined by the  
3     sequence of symbols in the second stream.

1           17.     The transmitter of claim 12, wherein the integer K is odd.  
2

1           18.     The transmitter of claim 12, wherein the digital data values are data bits.

1           19.     A receiver, comprising:  
2             a detector to receive a modulated carrier signal from a transmitter; and  
3             a mapper configured to use the received signal to determine values of input digital  
4     data values associated with a stream of input symbols that the transmitter used to  
5     modulate the carrier signal, the carrier signal being modulated by a stream of control  
6     symbols formed by processing the stream of input digital data values with a partial  
7     response function defined by  $[1 + \sum_{i=1}^K Z^{-i}]$ , the integer K being greater than one, and the  
8     functions  $Z^{-i}$  delaying the input digital data values by i multiplied by the time between  
9     successive ones of the input digital data values.

1           20.     The receiver of claim 19, wherein the detector determines optical  
2     intensities.

1           21.     The receiver of claim 19, wherein the mapper includes an inverse  
2     constellation mapper based on a constellation of transmission symbols in which at least  
3     two of the transmission symbols correspond to the same value for ones of the input data  
4     values.

1           22.     The receiver of claim 19, wherein the input digital data values are data  
2     bits.

1           23.     A receiver, comprising:  
2           an amplitude detector to receive a carrier wave and to determine a sequence of  
3 values representative of amplitudes of the received carrier wave; and  
4           an inverse constellation mapper to estimate a sequence of input digital data values  
5 based both on the sequence of determined values and on a relation between amplitudes  
6 of a symbol constellation and values of the input digital data values used to modulate the  
7 carrier wave, the relation associating at least two amplitudes of the constellation to the  
8 same value of an input digital data value.

1           24.     The receiver of claim 23, further comprising:  
2           an optical filter to select a frequency band, the detector coupled to receive the  
3 carrier wave belonging to the selected frequency band from an output of the optical filter.

1           25.     The receiver of claim 24, wherein the detector detects one of visible and  
2 near infrared light.

1           26.     The receiver of claim 23, further comprising:  
2           a slicer to receive the determined sequence of values from the detector and to send  
3 new values of amplitudes representative of symbols of the constellation to the mapper  
4 based on the received values.

1           27.     The receiver of claim 26, wherein the detector is configured to detect a  
2 carrier wave in a wireless channel.

1           28.     The receiver of claim 23, wherein the input digital data values are data  
2 bits.

1           29.     The receiver of claim 23, wherein the values representative of amplitudes  
2 are measured intensity values of the received carrier wave.